5. (20 pts.) A camera "lens" is usually a combination of two or more single lenses. Consider a camera lens consisting of a diverging lens, with $f_1 = -12\,\text{cm}$, and a converging lens with $f_2 = 4.2\,\text{cm}$, spaced 6.0 cm apart. A 10-cm-tall object is 50 cm from the first (diverging) lens.

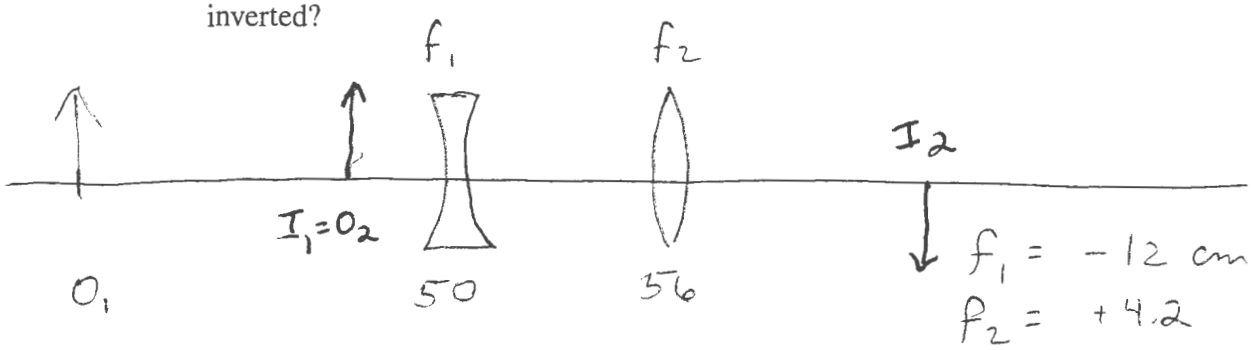
a. (10 pts.) Where is the final image located relative to the original object? Hint: Try making a sketch of the configuration and labeling your distances clearly.

b. (10 pts.) What is the size of the final image? Is it real or virtual? Is it erect or inverted?

5. (20 pts.) A camera "lens" is usually a combination of two or more single lenses. Consider a camera lens consisting of a diverging lens, with $f_1 = -12$ cm, and a converging lens with $f_2 = 4.2$ cm, spaced 6.0 cm apart. A 10-cm-tall object is 50 cm from the first (diverging) lens.

a. (10 pts.) Where is the final image located relative to the original object? Hint: Try making a sketch of the configuration and labeling your distances clearly.

b. (10 pts.) What is the size of the final image? Is it real or virtual? Is it erect or inverted?



a) 1st lens: $\frac{1}{f_1} = \frac{1}{d_{O1}} + \frac{1}{d_{I1}} \Rightarrow \frac{1}{d_{I1}} = \frac{1}{f_1} - \frac{1}{d_{O1}} \Rightarrow d_{I1} = -9.677$

$d_{O1} = +50$ cm.

This is at $50 - 9.677 = 40.32$ on the bench.

Then $d_{O2} = 56 - 40.32 = 15.68$ cm

$$\frac{1}{f_2} = \frac{1}{d_{O2}} + \frac{1}{d_{I2}} \Rightarrow \frac{1}{d_{I2}} = \frac{1}{f_2} - \frac{1}{d_{O2}} \Rightarrow \boxed{d_{I2} = 5.74}$$

This is at $56 + 5.74 = \boxed{61.74 \text{ cm}}$ on the bench.

b) $m = m_1 m_2 = -\left(\frac{d_{I1}}{d_{O1}}\right)\left(\frac{-d_{I2}}{d_{O2}}\right) = -\left(\frac{-9.677}{50}\right)\left(\frac{-5.74}{15.68}\right) =$

$m = -0.0708$

$h_I = m h_O = \boxed{-0.708 \text{ cm}}$ $\boxed{\text{Real, inverted.}}$